WHAT IS CLAIMED IS:

1. An apparatus for chemical synthesis comprising:

a plate including a plurality of wells, wherein each of the wells defines a bore extending from a first end to a second end of each well, includes a synthesis reaction medium disposed within the well between the first and second ends, and has an opening at the first end having an inner diameter of about 3.5 mm or less, an inner diameter at the synthesis reaction medium closest to the second end of about 3.0 mm or less, and each of the wells are arranged in a 2-dimensional array such that the wells are spaced apart from neighboring wells center-to-center by about 4.5 mm or less; and

a supply assembly including at least one valve for dispensing fluids through a nozzle, wherein the valve and nozzle together are configured to provide fluids to wells in volumes as small as about 2 microliters.

2. The apparatus of claim 1 further including a controller programmed to determine a dispersing pressure for dispensing fluids through the nozzle based upon a coefficient of variation of the dispersed fluids as a function of the dispersing pressure and a synthesis support scattering height as a function of the dispersing pressure.

3. The apparatus of claim 1, wherein the synthesis is carried out on synthesis supports retained by a porous membrane.

4. The apparatus of claim 1, wherein the membrane has bubble point pressure above 10 in. Hg .

5. The apparatus of claim 3 further comprising a pumping assembly in communication at the second end of the wells for applying a vacuum thereto, wherein the membrane has a bubble point pressure higher than the vacuum to be applied.

6. The apparatus of claim 5, wherein the wells have a gas flow rate in liters per minute less than the pumping rate of the pumping assembly.

7. The apparatus of claim 1, further including a controller programmed to conduct chemical synthesis in the wells on a reaction scale of less than about 20 nanomole.

8. The apparatus of claim 7, wherein the controller is programmed to conduct chemical synthesis in the reaction wells on a reaction scale of less than about 10 nanomole.

9. The apparatus of claim 8, wherein the controller is programmed to conduct chemical synthesis in the reaction wells on a reaction scale of about 5 nanomole.

10. The apparatus of claim 1, wherein the plate includes more than about 100 wells.

11. The apparatus of claim 10, further comprising three additional plates, wherein each of the three additional plates includes more than about 100 wells.

12. The apparatus of claim 1, wherein the nozzle is made from a material having a surface energy of about 20 dynes/cm or less and has a de-burred tip without sharp edges.

13. A method of conducting parallel chemical synthesis comprising:

determining a dispersing pressure for dispensing fluids through a supply assembly into reaction wells of a synthesis apparatus based upon a coefficient of variation for each dispersed fluid as a function of the dispersing pressure and a synthesis support scattering height in the wells for each dispersed fluid as a function of the dispersing pressure.

14. The method of claim 13 further comprising selecting reaction wells including a synthesis reaction medium such that the wells have a gas flow rate in liters per minute less than a pumping rate of a pumping assembly of the synthesis apparatus.

15. The method of 13 further comprising dispensing a plurality of reactants via the supply assembly into a plurality of wells of a parallel synthesis plate, wherein each of the

wells defines a bore extending from a first end to a second end of each well, includes the synthesis reaction medium disposed within the well between the first and second ends, and has an opening at the first end having an inner diameter of about 3.5 mm or less, an inner diameter at the synthesis reaction medium closest to the second end of about 3.0 mm or less, and each of the wells are arranged in a 2-dimensional array such that the wells are spaced apart from neighboring wells center-to-center by about 4.5 mm or less; and the supply assembly includes at least one valve for dispensing fluids through a nozzle, the valve and nozzle together configured to provide fluids to wells in volumes as small as about 2 microliters.

16. The method of claim 15, wherein the nozzle is made from a material having a surface energy of about 20 dynes/cm or less and has a de-burred tip.

17. The method of claim 15, wherein the synthesis is carried out on synthesis supports retained by a porous membrane.

18. The method of claim 17, wherein the membrane has bubble point pressure above 10 in. Hg.

19. The method of claim 17, further comprising draining each of the wells via a pumping assembly, wherein the pumping assembly is in communication at the second end of the wells for applying a vacuum thereto, and the membrane has a bubble point pressure higher than the applied vacuum.

20. The method of claim 13 further comprising performing chemical synthesis in the wells on a reaction scale of less than about 20 nanomole.

21. The method of claim 20 further comprising performing chemical synthesis in the wells on a reaction scale of less than about 10 nanomole.

22. The method of claim 21 further comprising performing chemical synthesis in the wells on a reaction scale of less than about 5 nanomole.

23. The method of claim 15 further comprising performing chemical synthesis in parallel in more than about 100 wells.

24. The method of claim 23 further comprising performing chemical synthesis in parallel in more than about 300 wells.

25. The method of claim 24 further comprising performing chemical synthesis in parallel in more than about 1,000 wells.

26. The method of using tightly sealed synthesis retaining medium such as a membrane or a filter frit for containing synthesis supports (e.g CPG) so that no synthesis supports can leak through the medium.